Spring 1967

South Dakota Farm and Home Research

Agricultural Experiment Station, South Dakota State University

South Dakota

FARM & HOME RESEARCH

Spring 1967

Volume XVIII Number 2

South Dakota Wildflower

(See Page 5)

Agricultural Experiment Station SOUTH DAKOTA STATE UNIVERSITY, Brookings

Duane Acker

From the Dean and Director

Selenium Research Ends at Reed Ranch Field Laboratory

Selenium research at the Reed Ranch "field laboratory" in Lyman County has provided sufficient knowledge so that South Dakota Agricultural Experiment Station personnel and funds involved there can be shifted to other, more pressing problems. The land at the facility reverted to the federal government last December.

Not that all questions dealing with selenium poisoning ("alkali disease" or "blind staggers") in range cattle have been answered—far from it. But some major findings and solutions, plus methods of diagnosis, have been field tested at Reed Ranch.

Now, researchers will cooperate with ranchers on an individual basis when selenium poisoning problems arise. And this approach may well serve ranchers even better because selenium conditions vary widely.

Although the field lab "has done its job" and is closed, selenium research continues in Station biochemistry and other laboratories on campus at South Dakota State University. As explained by a scientist connected with the project for many years ". . . now with what we've learned we can probably do as much by cooperating with individual ranchers who have problems."

The South Dakota Agricultural Experiment Station is credited with much of the research done on selenium poisoning, especially in range cattle. The Reed Ranch facility was the practical proving ground as scientists sought methods to help ranchers. A brief rundown of some of the Reed Ranch findings illustrates what scientists often face in seeking solutions to agricultural problems.

Plants Absorb Selenium

Selenium problems arise when animals over a period of weeks or months eat plants which have absorbed the element selenium from certain soils. Chronic (long continued) selenium poisoning can affect most farm animals. Symptoms generally are emaciation, lack of vigor stiffness of joints (often with swelling), rough hair coat, loss of long hair and cracking of hoofs. Hatchability of chicken eggs is reduced by selenium intake. Main range seleniferous areas in South Dakota are in the central-southern and western parts.

Selenium studies are extremely complicated, partly because the amounts involved are so small. Parts per million of selenium make the difference—and 15 p.p.m. in plant or animal is considered a high level. In humans, U.S. Department of Agriculture says concentrations of 5 p.p.m. in food or 0.5 p.p.m. in milk or water are considered dangerous. If we explain 1 p.p.m. as a distance, it would amount to an inch in about 16 miles. It became evident early that prevention was more important than cure, because damage done by selenium poisoning is slow in becoming apparent.

Selenium poisoning probably first became a matter of record in 1856 when an army surgeon at old Fort Randall reported " . . . a very fatal disease manifested itself among the dragoon horses. . ." Early settlers gave it the name "alkali disease," erroneously blaming alkali (high salt) in waters of the semi-arid region. In 1912-13, SDSU proved that alkali was not the cause. An old Sioux Indian legend possibly concerning selenium poisoning pointed (correctly) toward vegetation as the cause.

Control Difficult on Range

A preventative or cure for selenium poisoning must often be tailored to fit management practices for range animals. Animals raised in comparative confinement—swine and poultry, for instance—can be fed carefully regulated amounts of low-cost drugs that help prevent the disease. Since much of the seleniferous area of South Dakota is grazed by cattle, this phase of the problem becomes more acute.

Research at Reed Ranch progressed both figuratively and literally from the ground up. It started from "scratch"—little was known about it in 1937. And since selenium is found in the soil, part of the early investigations involved geological surveys. Certain geological formations in parts of South Dakota contain more selenium than others. When these formations containing selenium in relatively high amounts weather into soils, the soils are seleniferous. In a general way, selenium could be traced from these formations—but it is difficult to pinpoint concentrated spots in a pasture so they can be fenced off.

At first regular soil tests (from plow depth) were tried for mapping seleniferous areas. But it didn't work. Even analysis of soil to a 3-foot depth (where plant roots might reach) didn't help much.

Next, a system of mapping was tried by analyzing the same kind of

plant at the same stage of growth over a given area. This, however, served mainly to emphasize the widely varied intermingling of high and low seleniferous areas—still not much help to detailed map-makers.

Using Sea Salt Not Practical

Studies elsewhere indicated that applications of sea salt to soil depresses selenium uptake by certain plants. Sea salt as a soil application was tried at Reed Ranch and sure enough, uptake of selenium by certain plants was less. But, again, use of sea salt or certain other chemicals in soil applications was not deemed practical.

What about various plants? Some accumulate large amounts of selenium from seleniferous soils. These are called "converters" and sometimes are used as "indicators" because of an apparent requirement for the element in normal growth. Of the plants growing there in abundance, white aster contained the most selenium at Reed Ranch—up to 500 p.p.m. Some native grasses (western wheatgrass, for instance) usually contained less than 20 p.p.m. although this varied in localized areas. Radioactive elements were used in some of the studies.

Sulfur in the soil has something to do with intake of selenium by plants. But, added amounts above that occurring naturally don't do much good. Some plants normally low, more than double in selenium content when grown in association with "converter" plants. Usually selenium content is highest in young plants, gradually decreasing until maturity is reached.

Small laboratory animals continuously fed sub-toxic amounts of sodium arsenite along with seleniferous feeds actually had fewer selenium poisoning symptoms. But it didn't work out so well with cattle. For one thing, the arsenic compound was poisonous and could accumulate in tissues to constitute a danger to humans eating the meat. Getting the right amounts to range cattle (in salt) wasn't too satisfactory. Advantages of using arsenic materials with range animals were found to be slight.

Protein has some protective effect against the poisoning with small animals. Linseed oil meal was better for this purpose (especially in swine and rats) than other protein supplements. But the Reed Ranch proving ground showed that from a practical standpoint this wouldn't work for range cattle. Although results were "negative" in numerous instances, they were useful because they revealed to the rancher what *not* to spend money on to control selenium poisoning.

Bromobenzene and some related compounds fed to rats caused them to excrete high levels of selenium in the urine. Administered to cattle it reduced selenium content in blood and excretion of the element in urine was high. It appeared at first that these compounds might be used as a cure for selenized animals. From a practical standpoint, back at Reed Ranch, however, it was found that selenium poisoning symptoms in cattle were not greatly reduced.

Hair Samples For Diagnosis

Another step was to help ranchers learn if their cattle were in danger from selenium poisoning. Blood tests were used to obtain "average values" of selenium content. But blood tests were difficult to take, ship and preserve. A system was devised for using samples of hair instead of blood for the diagnosis. More than 10 p.p.m. of selenium in an analysis of a composite sample indicated the rancher had a dangerous problem.

Because common pasture grasses on selenium soils contain more of the element early in the season a long-term, time-of-breeding experiment was established. Will cows bred just prior to or during the season of lush growth produce more calves than cows bred later

(Continued on page 19)

contents . . .

South Dakota State University

SERVING THE PEOPLE OF SOUTH DAKOTA THROUGH TEACHING, RESEARCH, EXTENSION

SOUTH DAKOTA FARM & HOME RESEARCH

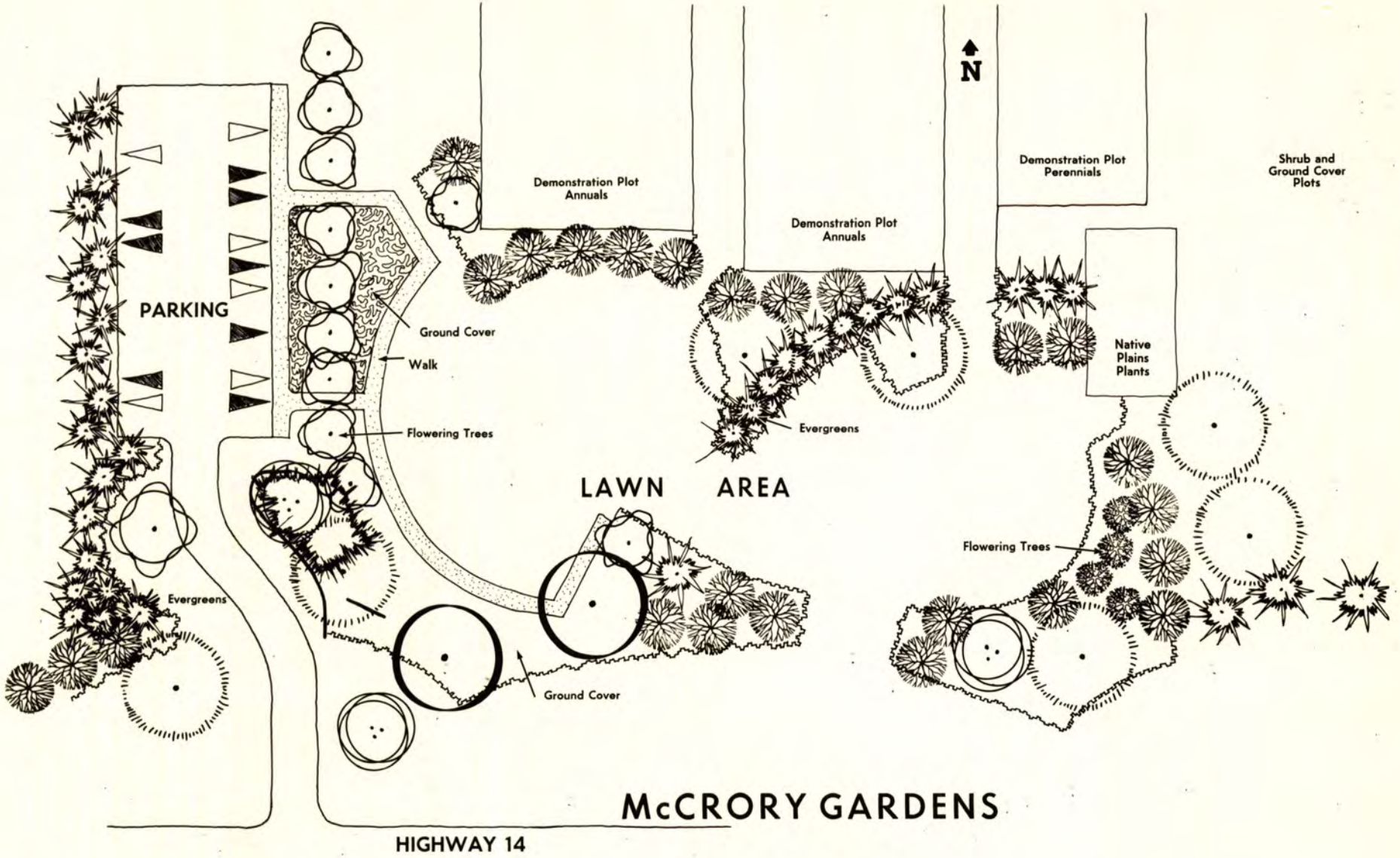
Volume XVIII Spring 1967 Number 2

A Quarterly Report of Progress

Duane Acker, Dean of Agriculture and Director, Agricultural Experiment Station.

Frank J. Shideler, Editor. (Editorial Office, South Dakota State University Brookings, S. Dak. 57006)

Published quarterly by the Agricultural Experiment Station, South Dakota State University, University Station, Brookings, South Dakota. This publication will be sent free to any resident of South Dakota in response to a written request.



Plan of the public area of McCrory Gardens, north of highway 14 in east Brookings. This design by LeRoy C. Johnson, landscape architect, SDSU.

McCrory Gardens

New Horticultural Research, Instruction, and Demonstration Area at SDSU. Special Tours of the Gardens Will Be Part of Horticulture Visitors' Day, July 27.

Front Cover . . .

This year's cold, dry, windy spring didn't daunt this South Dakota wildflower, one of the first to bloom in McCrory Gardens. This *Pentstemon angustifolius* is one of several dozen species of wildflowers which visitors may see in special native plant plots. (Photo: Leland L. Sudlow.)

McCrory Gardens, the new horticultural research and instructional area at South Dakota State University where the public may view growing ornamental plants by the hundreds, is expected to really "blossom out" this season.

The 15-acre tract is an expanded version of the popular horticulture gardens of the SDSU campus which were moved in 1965 to make room for new constrution. Situated along highway US 14 at the eastern edge of Brookings, the McCrory Gardens are expected to attract an increasing number of state and area visitors throughout the summer and early fall. A convenient parking area for visitors is adjacent to the highway.

"We believe the McCrory Gardens will serve not only as a research area and beauty spot for people to enjoy, but will also be a place where persons from throughout the state can come to learn more about the performance of various trees, shrubs and flowers," says Dr. Ronald M. Peterson, head of SDSU's Horticulture - Forestry Department. "Visitors are always welcome and as part of the development of the tract we make every effort to provide easy access to the various plots along with convenient identification of the plants," he adds.

Plans this year call for growing about 400 varieties of 59 species of annual flowers plus about 30 different kinds of perennial flowers, according to Dr. Peterson. Of special interest to many South Dakotans will be a collection of wild flowers native to western South Dakota. Forty species of wild flowers will be included in the collection obtained through Claude Barr, horticulturist - rancher of Smithwick. Other areas include collections of clematis and lilies.

Turf grass plots will provide an opportunity to evaluate various types and strains of grasses. Homeowners as well as persons involved in construction and maintenance of golf courses, parks and similar installations will find these plots of special interest.

Rather extensive testing of shrubs is underway in the Gardens. Some 100 species of shrubs are grown in short rows with strips of turf separating them to make viewing and study easier. Twenty-five species of ground covers, several vines and 30 species of trees are also included. The number of species of various ornamentals and the size of the garden will increase as the Gardens continue to develop.

McCrory Gardens are named in honor of the late S. A. McCrory, professor and head of the Horticulture-Forestry Department at SDSU from 1947 until 1964. Professor McCrory was instrumental in making preliminary plans for the garden.

Horticulture Visitors' Day scheduled on the campus for July 27 will include tours of the Gardens. □

Pelleted Feed for RANGE TURKEYS

Edmund Guenthner, instructor; **C. W. Carlson,** professor; and **Wm. Kohlmeyer,** professor and head, Poultry Science Department; and **A. W. Dittman,** superintendent, North Central Substation, near Eureka

How much feed is wasted by wind?

How much wind loss does pelleted feed prevent?

What is the value of forage and other crops on turkey ranges?

These and other questions face the turkey producer in deciding on range or confinement for growing turkeys.

In previous years, unexplained differences in feed consumption have been observed among pens of range turkeys grown at the North Central Substation near Eureka. Loss of feed caused by wind blowing it out of self-feeders was frequently noticed. Experiments, reported here, attempted to assess this type of loss by feeding the growing diets in pelleted and unpelleted forms.

The range plots were fenced to include approximately 1.1 acres in each pen. The plots were far enough from main buildings so that they received little or no protection from the wind. The plots were usually planted with two types of crops. Drilled corn or sorghum grew tall enough to furnish shade and wind protection and also supplied grain for the end of the growing period. Interplanted crops, rape or oats, supplied succulent forage during the early part of the growing period and, in favorable seasons, oats furnished additional grain.

Experiment 1 (1965)

Four groups each of approximately 100 large white, 9-week old, male poults were trucked from Brookings to Eureka. At 12 weeks of age, July 20, they were placed on test for a 12-week growing period ending October 12. The turkeys ranged on drilled corn interplanted with rape and were fed growing mash, whole oats, oyster shell and grit. The mash diet was a standard, 21% protein, turkey grower diluted with ⅓, ½ and ⅔ ground corn for each successive 4-week period of the experiment, giving diets of 17%, 15% and 13% protein. The mash was pelleted through a ¼-inch die for two of the pens, and fed in its original form (unpelleted) to the remaining two pens. The mash, pellets and whole oats were fed from metal, barrel-type feeders.

Experiment 2 (1966)

Similarly, four groups each of approximately 75 large white, started poults, including both sexes, were trucked from Brookings to Eureka and placed on test August 9 for a 12-week growing period ending November 1. Turkeys from two hatches were used, resulting in groups which were 23 and 25 weeks of age at the end of the experiment. The turkeys were ranged on drilled corn interplanted with oats. Mash or pellets, oyster shell and grit were fed as in 1965. Additional oats was not fed, but was supplied by the range.

Results and Discussion

Results of the two experiments for 1965 and 1966 are summarized in table 1. In both experiments the pellet-fed pens required 5 pounds less feed per turkey than the pens fed mash. The feed requirement was based on the net feed weighed into the self-feeders, and included the various losses. On windy days considerable amounts of mash and lesser amounts of whole oats and pellets were blown out of self-feeders. But poults picked up the scattered oats and pellets with little apparent waste. Much of the mash was probably not recovered.

Wind velocity records were not available for the location at Eureka. Observations at Sioux Falls, Huron and Rapid City indicate that monthly average wind speeds are relatively uniform for these points, but winds exceeding 25 m.p.h. occur more frequently in the central and western portions of the state. The major feed losses occur during periods of high winds. Selected data showing percentage frequencies and average wind speeds are compiled in table 2.

The pellet-fed turkeys were consistently heavier than the mash-fed turkeys. The combined effects of the improved weight and reduced feed requirement resulted in an average saving of a half pound of feed per pound of gain. Gain, in this case, refers to the change in weight of the turkeys during the 12-week growing period. Although pelleting involves additional expense in feed preparation, research elsewhere indicates that both physical and non-physical changes occur during the pelleting process which significantly improve growth and feed efficiency.

Range and facilities at the beginning of the experiment at the North Central Substation near Eureka.

Mash and pellets (actual size) of type used in this investigation.

Table 1. Summary of Range Turkey Experiment

Experiment, year	1965		1966	
Sex	All males		Males and females	
Diet treatment	Mash	Pellets	Mash	Pellets
Number of birds	182	179	143	137
Death loss, %	10.3	13.1	10.0	13.8
Average 12 week wts., lbs.	10.7	10.9	8.3	8.2
Average 24 week wts., lbs.	26.3	26.6	19.4*	20.3*
Average gain	15.6	15.7	11.2	11.6
Total gain, lbs.	2,843	2,803	1,607	1,586
Total feed supplied, lbs.	14,251	12,861	8,665	7,625
Grower	9,793	8,718	8,665	7,625
Oats	4,458	4,143	----	----
Feed supplied per bird, lbs.	78.3	71.8	60.6	55.7
Grower	53.8	48.7	60.6	55.7
Oats	24.5	23.1	----	----
Oyster shell	1.4	1.2	2.1	1.6
Grit	2.0	1.5	1.4	1.2
Feed supplied per lb. gain	5.0	4.6	5.4	4.8
Grower	3.4	3.1	5.4	4.8
Oats	1.6	1.5	----	----

*Weighted averages adjusted for unequal sex numbers.

Table 2. Frequencies of High Winds and Average Wind Velocity

Locations and months	Above 25 m.p.h. (% of time)	Average wind velocity m.p.h.
Sioux Falls		
August	1.0	9.0
September	1.0	10.0
October	2.0	10.6
Huron		
August	1.4	10.6
September	2.9	11.4
October	4.3	11.9
Rapid City		
August	2.4	10.5
September	3.4	11.1
October	5.4	10.9

Taken from: Climatography of the United States, U. S. Department of Commerce, Weather Bureau.

The ranges were planted with corn and rape in 1965. A good stand of corn was obtained but severe insect damage resulted in a poor growth of the rape. Whole oats were fed free choice in addition to the grower. As a result, 75 pounds of feed (oats and mash combined) was required for each turkey. In addition, the corn was completely harvested by the turkeys.

The ranges in 1966 were planted with corn and oats. Excellent stands of both crops were obtained. The oat crop set seed, so no additional oats was fed. At the end of the growing period, all oats had been harvested by the turkeys but some of the corn remained standing. An average of 58 pounds of grower was fed to each turkey. Poults of both sexes and two ages were used in 1966, so that a direct comparison with the 75 pounds of feed used in 1965 should not be made without these considerations. However, ample forage and good range conditions are reflected in reduced feed requirement.

Oyster shells and grit were fed in both experiments. On the average, relatively small amounts of each were consumed per bird, but considerable variation was noticed between pens. The necessity or value of feeding shells and grit on range was not determined.

Approximately the same rates of death losses were observed in both experiments. These poults were hatched and brooded at Brookings. At 9 weeks of age, the poults were trucked to Eureka. Approximately 10 hours elapsed from loading until poults were released from the crates at Eureka. Stress caused by the trip may have been a factor in the death losses experienced later in the experiment. Under conditions of this experiment the approximate 3% difference in death losses between the two groups was not deemed significant.

Conclusions

Based on two experiments, involving approximately 700 turkeys grown on range, these observations were made:

- Pelleting saved 8% to 9%, (or 5 pounds) of feed per turkey. This saving resulted from the combined effects of reduced wind losses and the improved efficiency of pellets.
- Turkeys fed pellets tended to weigh heavier than turkeys fed mash.
- Ample forage and range crops reduced the amounts of concentrates fed. □

Family Estate Planning

By **Kenneth R. Krause,**
associate professor of economics

HAVE YOU developed your family objectives and goals in regard to the building and ultimate passing on of your money and property?

If your answer is yes, you have started on your family estate plan.

But if you haven't formally planned your estate, your family may not receive the direction for its life activities that you want to give them. When you die your assets will be distributed according to South Dakota inheritance laws and this probably isn't just the way you want to leave your property.

Why Plan Your Estate?

Whether your net worth is large or small, whether you have just started farming or have been farming a number of years, you have at least a moral obligation to provide your children with an education and a start in the world. Many people mistakenly believe that estate planning is for wealthy persons alone. But this is not the case. Families in moderate circumstances are often placed in unfortunate positions because of lack of proper estate planning.

State and federal laws permit considerable flexibility in planning and executing estates and since *your* family is unique your plan will be highly individualized. If your property is worth over a certain amount, inheritance and estate taxes will be due when you die. With advanced planning however you can minimize them. Through an estate plan you can control the disposal of your property upon death.

By developing a plan for net worth accumulation when you are relatively young, you may set financial goals for your life's work. While you may not follow the initial plan, if it is properly developed you will have something to adjust from and to work toward.

A long range farm plan and an estate plan which is developed early in your career may have considerable influence on values and goals of your children. These may help them develop strong interests in farming and, more importantly, to understand managerial processes and to seek training to develop management ability.

When to Plan Your Estate

An estate plan is important at any stage in life. It is often wise to begin planning when you finish high school or college. A comprehensive plan can give guidance to activities throughout life. Understanding appropriate tools and laws and a familiarity with property titles, taxes, and survivorship rights can make planning a challenge.

Review your estate plan at least every 5 years and possibly more often, depending on changes in: (1) new family members, (2) family health conditions, (3) net worth or assets and liabilities, (4) the interest of your children,(5) outlook in your type of farming, and (6) laws affecting your estate plan.

Tasks in Planning Your Estate

There are several tasks to be considered and performed in estate planning. They are inter-related. These include:

(1) Provide lifetime personal and family income at a satisfactory level of security and enjoyment. This involves your daily activities in managing a business ror profit and other goals.

(2) Managing real estate, personal property, income taxes, achieving a satisfactory retirement program, arranging for legal transfer of your farm and other assets prior to or upon death and reducing taxes that will occur upon your death.

(3) Consider your family and other heirs involved in your estate plan. Your wife should be able to carry on a satisfactory life at any time in your absence. If your children are planning to farm, you may want to include them in the operation early in life and possibly help them establish an ownership interest in the operation.

(4) Plan for the period immediately following your death when cost demands on your estate are great. Such items may include your last illness, funeral expenses, claims of your creditors, estate administration costs, and state and federal taxes. Unless your estate plan includes some cash or assets easily converted to cash, personal property or real estate may have to be sold to meet immediate expenses. A forced sale may result in loss of some

CIRCULAR AVAILABLE

Additional details about the frequently involved processes encountered in estate planning can be obtained from Agricultural Experiment Station Circular 177, "Family Estate Planning," available from the Bulletin Room, South Dakota State University, Brookings, South Dakota, 57006. The publication is written by Kenneth R. Krause, assistant professor of economics at SDSU, with reviewing assistance by Professor Edwin Hadd, Law School, University of South Dakota. The circular or this article are not substitutes for competent legal help. After careful study of these materials, you are encouraged to work with an attorney.

farm assets which will be reflected in less income for your survivors and perhaps lower value of the remainder of your farm assets.

(5) Plan for the family adjustments necessary after your death. Adequate security and income for your widow and an equitable distribution of your remaining assets among your children and family are relevant concerns.

Following, in summary form, are some items you will be involved with in planning your estate. These are discussed more fully in Agricultural Experiment Station Circular 177, "Family Estate Planning," available through South Dakota State University.

Taxes in Estate Planning

It is entirely proper and within the framework of inheritance and estate tax laws to work with the regulations to reduce or avoid taxes upon your death. Develop your plan to secure tax savings consistent with your other goals. You will need to be concerned with the federal estate tax, the South Dakota inheritance tax, the federal income tax, the federal gift tax, and state and local property taxes.

Transfer, Title, and Operating Tools

Several alternative methods are available and often used for transferring property prior to or upon death. If properly used, these can help reduce estate and inheritance taxes, help heirs find a sense of security and achieve greater operating efficiency if they gain part or full ownership of property before parents die.

The Will

A will is employed to distribute property at death in a manner different from the plan devised by law under the laws of descent. It can be altered or revoked at any time as long as the person is of sound mind. As a result, there are a number of ways that a will can help you accomplish the goals and objectives of your estate plan.

Joint Tenancy

Property held in joint tenancy does not pass as part of an estate, but a portion passes directly to the other owners. It takes precedence over division of property expressed in a will. Each owner of property held this way has a right to destroy the arrangement and the right of survivorship and take his proportionate share of the property outright at any time. It may save probate costs but not inheritance or estate eaxes.

Tenancy-in-Common

Two or more persons each own undivided but not necessarily equal shares in real estate under this arrangement. There is no right of survivorship. Each co-tenant at any time can sell, give away, or transfer upon death his share of such property.

Transfer by Gift

Passing property to heirs during one's lifetime can mean major savings in estate and inheritance taxes upon death. There are two rules under which a person can give tax-free gifts—yearly gifts and gifts over a a lifetime.

The Trust

A trust may be created during life to continue after death or it may be set up in a person's will to become effective upon his death. It can help assure efficient property management for heirs with limited management ability while still providing for your steady retirement income. A trust can also be set up to help assure that a farm will continue to be operated as a single economic unit under unified management without unreasonable restrictions after a farmer's death.

The Annuity

An annuity is a right to a sum of money for a specified period of years or for life. It can be set up to transfer property to children and still provide income for parents or a surviving spouse. Parents may transfer a farm to children in return for a promise by the children to pay a fixed amount per year for the remainder of the parents' life. This is known as a private annuity. Commercial annuities are also available.

Partnership Arrangements

A family partnership can be set up so that a market value is attached to property and periodic gifts of part of the property can be given to children. The subject of these gifts may represent the child's capital contribution to the partnership business. An installment land contract may also be used to transfer property to children.

Incorporation

A major advantage of the corporation in family transfers is that a definite value is placed on property that may be transferred to children, either by gift or by sale. A second advantage is that parents may rapidly or gradually withdraw from the operation of the business and by sale of their stock establish a satisfactory retirement income. It can further help to accomplish the objectives of keeping the farm as a going business while a son or children are building up equity in the

(Continued on page 19)

Relationship of Dieldrin and Penned Pheasants

By **Raymond L. Linder,** associate professor, Wildlife Management Department and **Donald W. Lamb,** graduate assistant, Station Biochemistry Department

Toxic chemicals used to control insect pests are important to agricultural production. At the same time, there is considerable interest in the effects of such insecticides upon our wildlife population.

The effects of such chemicals on pheasants are of special interest in South Dakota because of the economic importance of this game bird to the state. When this study to evaluate possible influences of one of the hydrocarbon insecticides (dieldrin) upon pheasant populations was started, this chemical was being recommended for use in control of certain insects such as cutworms and armyworms in corn and grasshoppers in a number of crops. Since that time registration of dieldrin has been cancelled by the U. S. Department of Agriculture for use on field crops as a foliage treatment and it no longer is recommended for such use in South Dakota. Another hydrocarbon insecticide, which does meet federal approval, is used to control wireworms and cutworms in corn. This insecticide (aldrin) changes chemically to dieldrin in soil and organisms.

During the past 2 years investigations have been conducted to study the effects of sub-lethal doses of dieldrin on penned pheasant hens. Birds were caged individually and given encapsulated dieldrin every 7th day for 13 weeks to determine residue deposition and its effect upon hens, eggs, and chicks. In 1965, treatment levels were 0, 2 and 4 milligrams per hen per week and in 1966, 0, 2, 4 and 6 milligrams per hen per week.

Residue Deposition

In 1965, one egg per hen was collected at about weekly intervals for the first 12 weeks and all eggs were collected for 2 weeks following the 13th treatment. Yolks of eggs were analyzed for dieldrin using a florisil sample clean-up and electron capture gas chromatographic analysis. (Work with chicken eggs has shown that residues occur in the yolk.) Yolks from the 0 mg. group (the control) contained no level of dieldrin greater than 0.1 p.p.m. In eggs from hens receiving dieldrin, residues generally appeared within the first week after treatment and slowly built up as each weekly capsule was administered (table 1). Hen 1 in the 4 mg. group displayed a reverse in this trend as no eggs were laid during the first 6 weeks and the egg laid the 7th week contained the highest level of residue. This suggested that much of the chemical residue was eliminated from the hen's body when eggs were laid. Based upon the assumption that the dieldrin recovered in the egg yolk analyzed represented the average of all eggs laid during that particular week, hens in the 2 mg. group passed about 21%, 19% and 37% of the total dieldrin adminstered and hens in the 4 mg. group passed about 30%, 23% and 20% via the egg yolk. No significant difference was found between treatment groups in this respect. There was a slow decline of residue deposition in the eggs laid within 14 days after termination of treatment (figure 1). Analysis of fat at the end of the experiment showed highly significant differences in residue levels between treatment groups. Averages were 20.7 p.p.m. for the 2 mg. group and 41.2 p.p.m. for the 4 mg. group. Analysis of eggs laid in 1966 showed residue levels in the 4 mg. group comparable to levels found in 1965. Eggs from the 6 mg. group (1966) reflected the higher intake of dieldrin by containing the highest levels of residues (table 1).

Hen pheasants were kept in these nest-boxes. Water and feed were available at all times from a tray which slides into the front of the box.

Effects on Hens

Records of feed consumption for each hen were maintained throughout the treatment period. Statistical analysis detected no difference between treatment groups regarding food consumption in 1965. However, in 1966, analysis showed that the 4 mg. and 6 mg. groups consumed significantly less food than the 2 mg.

and control groups. Generally there was an inverse relationship between food consumption and the level of treatment. Since the dieldrin was encapsulated it had no effect on the palatability of the food. Thus, the dieldrin affected the hens in an unknown manner to reduce food consumption.

During the experiment hens were weighed at weekly intervals. In both years there was a significant difference between treatment groups for hen weight. However, only the 6 mg. group in 1966 exhibited a conspicuous reduction in body weight compared to the controls (figure 2). Evidently 6 mg. of dieldrin per week is enough to reduce feed consumption and cause a loss of weight in penned hen pheasants.

Hens of the 6 mg. group laid significantly fewer eggs than hens of the control group. However, rate of

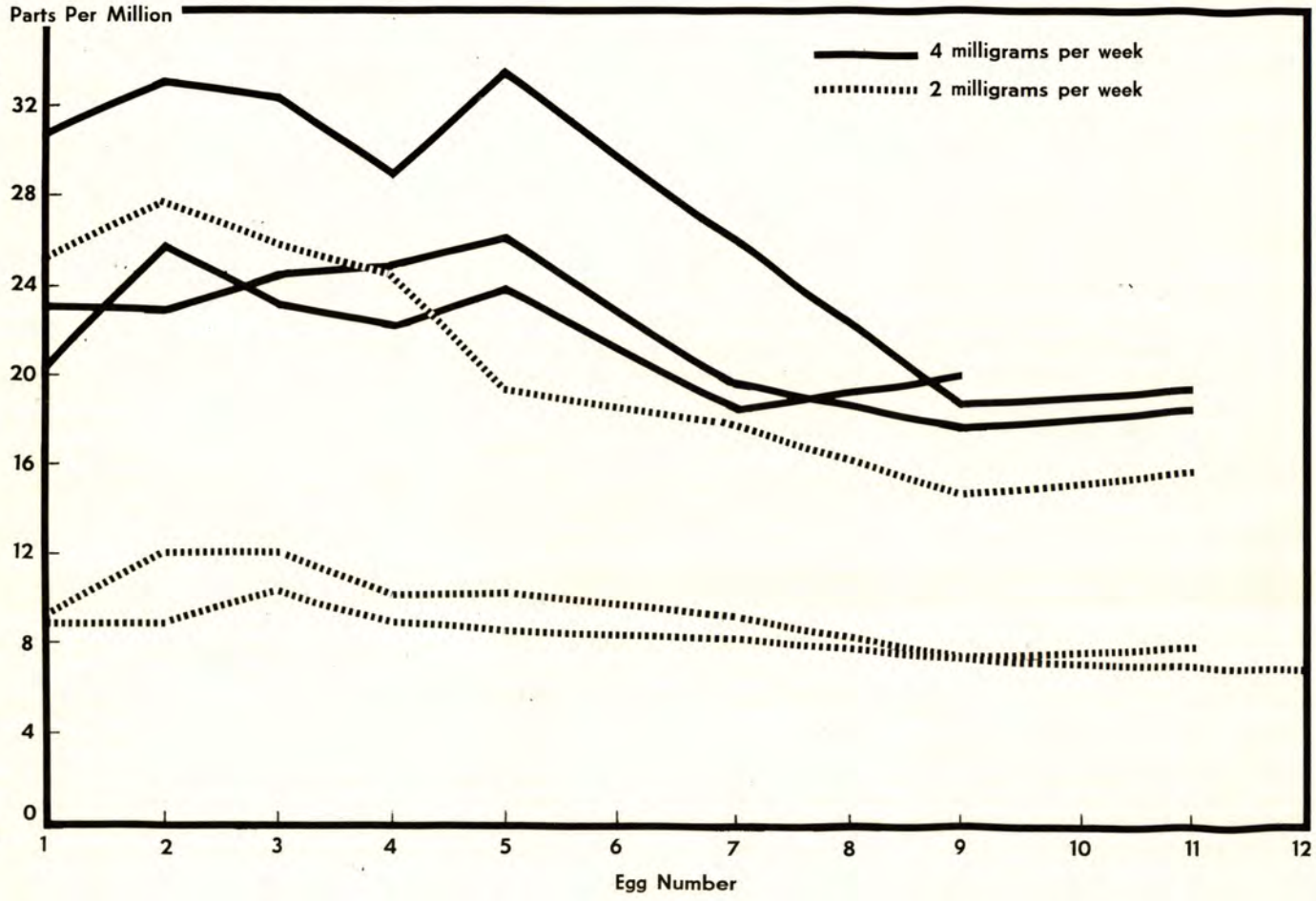
(Concluded next page)

Encapsulated dieldrin was given the hen pheasants through a small tube inserted into the gullet. This assures that a known amount of dieldrin reaches the digestive tract.

Table 1. Dieldrin Content of Egg Yolks (parts per million)

Week of treatment	1965 Treatment						1966 Treatment					
	2 mg/wk			4 mg/wk			4 mg/wk			6 mg/wk		
	Hen 1	Hen 2	Hen 3	Hen 1	Hen 2	Hen 3	Hen 1	Hen 2	Hen 3	Hen 1	Hen 2	Hen 3
1	0.6	0.7	1.1	.....	5.3	.....						
2	2.6	....	2.3	.....	9.3	.....						
3	4.8	....	6.0	.....	10.3	11.7						
4	5.0	5.2	6.0	.....	12.4	13.0	11.6	11.6	7.5	21.4	13.3	27.3
5	5.7	6.1	6.8	.....	11.9	15.4						
6	5.7	7.9	8.2	.....	12.7	13.5						
7	6.3	9.0	9.8	40.1	15.8	17.3						
8	5.9	9.2	10.5	35.9	15.0	15.5	17.6	18.0	18.3	32.7	34.4	41.6
9	6.6	8.7	15.2	40.1	18.8	18.6						
10	6.5	8.2	13.2	35.6	18.9	19.1						
11	7.6	8.8	22.1	32.7	20.4	19.2						
12	7.8	7.6	26.5	27.5	18.0	.....	20.6	20.0	.....	.....	52.4	45.5

Figure 1. Dieldrin in yolk of eggs laid by six pheasant hens during a 14-day period following final treatment.



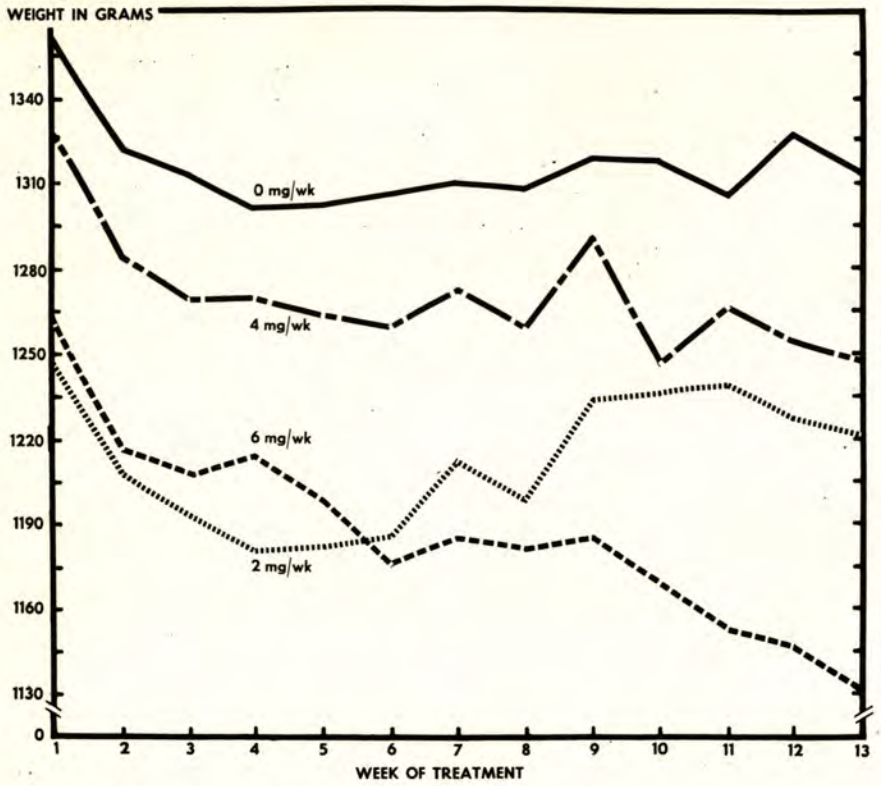


Figure 2. Mean weekly weights of pheasant hens on treatments in 1966.

egg production was not consistent with the level of treatment but varied more closely with food consumption. In 1965, food consumption was not significantly affected by dieldrin and no effect on egg production was observed. In 1966, the mean food consumption of the 6 mg. group was 9.2 grams per day less than the controls and a corresponding reduction of egg production occured. Mean food consumption of the 4 mg. group was reduced 3.7 gm. but egg production was not significantly lowered. It appears that only the 6 mg. treatment had sufficient effect on food consumption to reduce egg production.

Effects on Eggs

There was no significant difference in fertility between treatment groups either year (table 2). In 1965, hatchability of the 2 mg. group was significantly higher than the controls, however, the difference between the 4 mg. group and controls was not significant (table 2). Differences in hatchability between treatment groups were not significant in 1966.

The dieldrin apparently had no effect on either fertility or hatchability except possibly increased hatchability of the 2 mg. group in 1965. We cannot explain the increased hatchability of the 2 mg. group unless the low level of dieldrin had a slight stimulatory effect.

Effects on Chicks

All chicks hatched were held in brooders until 4-5 weeks of age when they were moved to outdoor pens. Each chick was weighed weekly until 8-9 weeks old. Statistical analysis showed no significant difference in survival of chicks to 8 weeks of age (table 2).

Table 2. Percent Fertility and Hatchability of Eggs and Survival of Chicks

Level of treatment	Fertility	Hatchability	Survival 0-8 weeks
1965			
0 mg	78.7	72.3	55.9
2 mg	70.4	85.0*	51.4
4 mg	77.4	73.6	44.4
1966			
0 mg	61.4	54.0	72.2
2 mg	63.8	51.5	71.0
4 mg	62.5	44.6	75.0
6 mg	59.5	46.3	74.1

*Significantly different from control at (0.05) level (chi-square).

Total weight gain was not consistently related to the level of treatment. Differences that existed between groups were small and did not reflect level of treatment. Furthermore, no pattern in weekly gain was established during the weighing period. The differences in gain between groups continually changed. Apparently dieldrin was not the dominant factor influencing weight gain of chicks.

Discussion

Chemical analysis showed that dieldrin fed in capsules occurred in its original form in pheasant eggs and fat for at least 14 days after termination of treatment. Thus, in the wild, if a hen is exposed to dieldrin before egg laying begins, residues will probably be present in all eggs of an average clutch. After completion of the clutch, the hen retains residue in her tissues.

In general, it appeared that dieldrin at the 6 mg. level reduced feed consumption and body weight, thus lowering the condition of the hen and impairing her ability to lay eggs. However, condition of the the hens and the residues in the egg yolks apparently did not affect hatchability of eggs or viability of chicks. In view of these results, it appears dieldrin may affect reproduction in two ways. First, by decreasing rate of egg production, clutch size may be reduced. Second, by lowering feed consumption and reducing body weight, the hen's ability to cope with stresses of incubation, brooding, molting and the environment may be impaired. However, it is not known if the additional stress of dieldrin affects survival and reproductive efforts of hens in the wild.

Further studies are necessary to relate the findings of these studies to the wild. Eggs laid by wild hens should be collected and chemically analyzed to determine dieldrin content. These residues may then be compared with those found in eggs from the pen study. With limitations inferences may then be made regarding the effects of dieldrin on pheasant reproduction in the wild. □

Research on

Machinery Noise Levels

EAR SPLITTING noise is the basis for a research project of a South Dakota State University agricultural engineering professor.

He got his inspiration from the SDSU speech department.

Ag Engineer Paul K. Turnquist wants to do something about hearing loss due to long exposure to dangerously high noise levels, caused mainly by combines, tractors and other farm machinery. Hearing loss of various degrees can almost be considered an occupational hazard for farmers and ranchers, he believes. It starts when teenagers and young people are exposed to high noise levels when working around farm machinery. Continued exposure may lead to hearing loss which may not be noticed until they reach middle age, he says.

A report by SDSU's Speech and Hearing Center had a lot to do with Turnquist's interest in prevention of hearing loss. Group tests of 1,500 students by the center indicated that their incidence of hearing loss was three or four times the estimated national average. The speech department traced much of the trouble to student's previous exposure to loud noises, particularly from tractors or other farm machinery.

Few Realize Hazard

Turnquist says he doesn't think many farmers realize the hazard of the high noise levels associated with farm machines. It is not uncommon to experience a ringing sound in the ears after driving a tractor all day. This is a temporary hearing loss and usually disappears overnight. The use of ear plugs, special "ear muffs" or astronaut-type helmets as ear protection devices would greatly aid in the prevention of hearing loss.

Without going into all of the complexities of noise levels and the sound spectrum, Turnquist explains that years of research and experience have shown the lower noise level danger starts at a point below that of the noise produced by tractors and other farm machines. Tractor noise, for instance, has about the same loudness as a noisy factory.

The ag engineer suggests that noise may be investigated at its source (a tractor, for example), at the receiver (and a lot of work has been done in this sector by industry), or along the "path" from source to receiver. Changing or altering this path is the basis of research by Turnquist and Tom S. Chisholm, a graduate student formerly of Morristown, New Jersey. One possibility is sound deadeners for tractor cabs or a special acoustical arrangement of materials to minimize noise before it reaches the ear.

Noise Has Many Parts

But before "noise blockades" can be investigated, a lot more needs to be known about sound produced by farm machinery. Turnquist explains that the overall noise you hear from a tractor is made up of many parts or frequencies—several each, for instance, from transmission, engine, and accessories. For research purposes the total sound spectrum must be broken down into frequencies and identified. This is important because medical doctors have noted, Turnquist points out, that in its early stages noise injury to the ear mechanism is usually affected by the high frequencies. But with continued or prolonged exposure to noise, gradual and insidous deterioration of hearing often follows in the low frequencies.

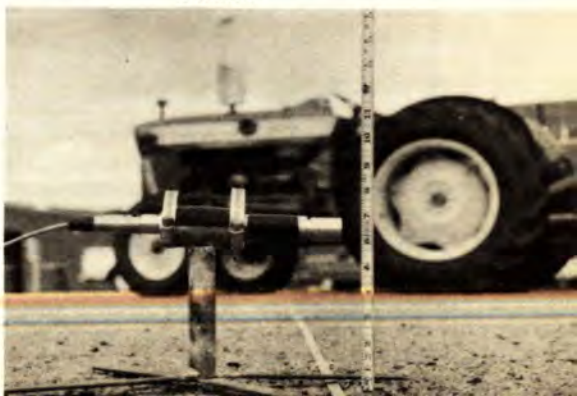
Chisholm and Turnquist have started the complicated process of making octave band analyses of tractor noise. A special commercial octave band analyzer and recorder is used. The equipment, costing about $3,000, was furnished in part by the National Science Foundation.

Agricultural engineers at SDSU have put a microphone in the driver's seat of a tractor in research aimed at learning more about dangerous noise levels of agricultural machinery.

This research is much more than just listening to a tractor in operation. An imaginary hemisphere is placed over the tractor and the sound spectrum is measured at definite points on the surface of the hemisphere. This permits determination of the total sound energy radiated by the tractor and aids in characterizing the sound path. This preliminary stage is what Chisholm has been working on the past year or so.

Turnquist claims that until and unless farm tractor drivers begin dressing like astronauts or wear ear plugs, something else should be provided to interrupt noise on its way from its source to the operator's ear. □

Microphone mounted to pick up noise near ground level several feet from tractor.



Planning Your Irrigation

System . . .

WATER USE RATES

By **Walter D. Lembke,** associate professor of agricultural engineering, and **John L. Wiersma,** director, Water Resources Institute

ONE OF THE most critical steps in planning an irrigation system is determining the amount of water the growing crop uses on a daily basis. Since the most important time in the growing season of most crops is when they have the highest water use rate, the irrigation system must be planned with this high rate in mind. The maximum use rate of water by the crop is directly related to the rate of water supplied if the irrigation system is doing its job.

The importance of determining the use rate is particularly great when irrigation is from wells. The capacity of the well and pump limits the rate that water can be applied to a given area. A well and pump installation represents a high proportion of the total cost of an irrigation system. At present, more than 100,000 acres are irrigated from wells in South Dakota.

The use rate at any given time is determined by the climate and the crop. As the climate becomes hotter and dryer, the use rate increases. The use rate also increases as the crop approaches maturity. In the case of corn, the maximum occurs at the time when ears are being set shortly after the silking stage. This period lasts about a month, generally during July. This maximum rate has been found to exceed 0.30 inches per day for hot, dry weather while it may be reduced to 0.10 inches per day or less during cool weather.

USE OF WEATHER RECORDS

Weather records are available which permit us to determine hot, dry periods during the growing season. "Precipitation Probabilities in the North Central States" and "Climatological Summaries in South Dakota" are available through the State Climatologist's Office at Brookings. Evaporation pan records are available from several U. S. Weather Bureau stations in South Dakota. The rate of evaporation of water from pans is not the same as water use rate from crops for a given day. It can be corrected, however, to give values close enough to crop use for planning irrigation systems. For example, using soil moisture data for corn in eastern South Dakota, it was found that multiplying evaporation pan measurements by 0.60 gave a reasonable estimate of water use by corn during the tasseling and silking stage. Evaporation pan data for a 20-year period at Brookings was used to determine the expected average water use rates for corn during July, as shown in table 1.

All agricultural soils have some capacity to hold moisture. As the soil becomes dry, some of the moisture is held too tightly for plants to use. The remainder of the water that the soil can hold is usable and can be thought of as the moisture reservoir for crops. This reservoir is depleted by crop water use and can be replenished by natural rainfall or irrigation. The time involved for crops to use this available water is called the moisture depletion period. If the use rate is high, this period is short; but if the use rate is low, this period is long. This period also depends on the capacity of the moisture reservoir. In sandy soils and with shallow-rooted crops, this capacity is low and the period is sometimes shorter than a week. In clay loam soil and with deep-rooted

SPEAKING OF IRRIGATION . . .

Four new irrigation publications by the Cooperative Extension Service at South Dakota State University are available through your county Extension agent or from the SDSU Agricultural Bulletin Room.

Prepared by Extension and Agricultural Experiment Station personnel, these publications cover what you need to know before selecting an irrigation system, a comparison of costs in systems as well as irrigation vs. dryland farming, irrigation practices, soil, water quality. From time to time additional publications will be available.

The four new ones are:

Fact Sheet 332 "Selecting Your Irrigation System — Comparing Five Common Types."

Fact Sheet 333 "Irrigation Practices—How They Are Related to Soil Characteristics."

Extension Circular 654 "Irrigation: Your Water, Your Soil."

Extension Circular 655 "Irrigation Costs and Returns."

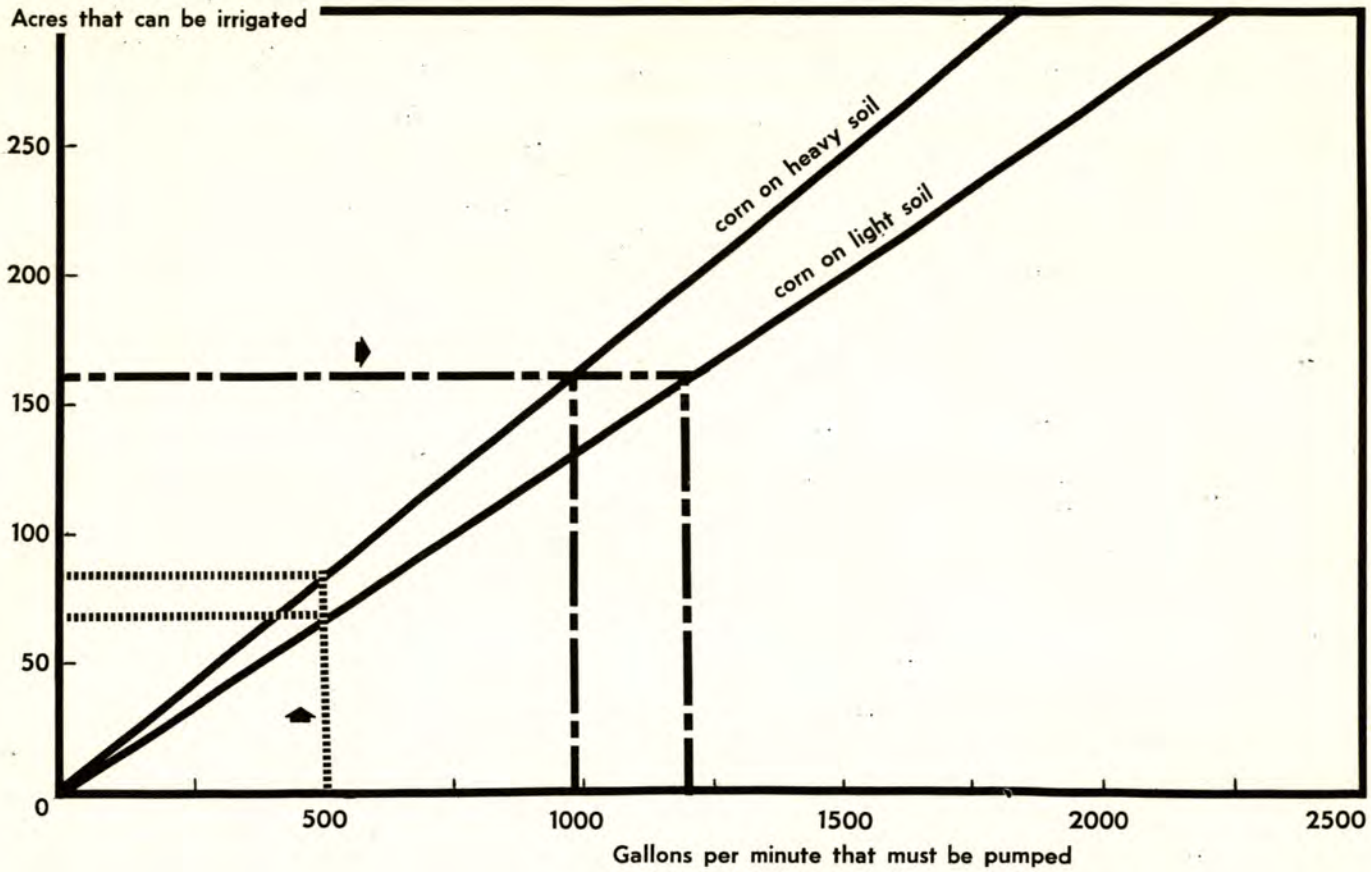


Figure 1—Acres of corn that can be irrigated for different pumping rates assuming a 70% efficiency and 20 hours per day of operation.

If you plan to irrigate 160 acres, read up to the 160-acre mark on the vertical (left) scale. Go across (horizontal dash line) to where this line crosses the diagonal lines. Note where the dash line intersects either the "heavy soil" or "light soil" diagonal lines (whichever applies in your case). At this point you can determine the amount of water needed, in gallons per minute, by dropping a vertical line (vertical dash line in figure) to the horizontal (lower) scale that reads from left to right.

By reversing this procedure you can figure how much acreage an available water supply would irrigate. For example, your well can pump 500 gallons per minute. Go up to where the dotted line intersects the two soil-type lines. Go across to the left from these intersections (horizontal dotted lines) and the acreage can be determined (here, about 65 acres for light soil or about 80 acres for heavy soil).

crops, this capacity is high and the period is sometimes longer than 2 weeks.

DETERMINING IRRIGATION PERIOD

The time required for the irrigation system to replenish the soil moisture reservoir for all the acres irrigated is the irrigation period. This time is determined by the well and pump capacity, the number of acres irrigated, and the capacity of the soil moisture reservoir. The irrigation system always has to supply more water than what actually gets to the soil moisture reservoir. This additional amount depends on losses which occur, such as seepage, evaporation and deep percolation. An irrigation system should be planned so the irrigation period in not longer than the moisture depletion period during the time when the use rate is highest. In other words, you must be able to provide water at least as fast as the plants need it during the critical time of the season. Too little water will result in wilting or high moisture stress. This is the critical moisture depletion period and will vary in length from year to year depending on how hot and dry it is at this critical time. It is recommended that planning be based on an irrigation period that is less than or equal to the critical depletion period 4 years out of 5 on the average. During the remainder of the season the depletion period will be longer because of lower plant use.

As far as irrigation planning is concerned, the maximum 1-day use rate, as shown for corn in table 1, can be lowered as the depletion period becomes longer and the chances of having cool weather during the period increase.

Natural rainfall adds to the soil

Table 1. July Average Water Use Rate for Corn for Time Periods Indicated (Exceeded 1 Year Out of 5)

Days	Average water use (inches per day)
1	.29
7	.23
14	.21
30	.20

moisture reservoir. Summer rainfall comes at high intensities and some will be lost in surface runoff. The rainfall which does get into the soil moisture reservoir extends the depletion period. If we can depend on rainfall coming during the depletion period, we can consider it to have the same effect as reducing the daily use rate.

Weather records are available which tell us the probability of rainfall during the growing season. Table 2 was prepared using "Precipitation Probabilities in the North Central States." This gives the average daily rainfall that can be expected for various time periods in east-central South Dakota during July. These amounts or more can be expected 4 years out of 5. Similar figures are available for other areas.

PLANNING THE SYSTEM

For irrigation planning the average use rate during the critical soil moisture depletion period can be combined with the reduction in use rate that can be expected from natural rainfall. This results in an adjusted use rate that can be used to plan irrigation systems. *Keep in mind that this adjustment should be used only in planning a system.* This does not mean that a farmer should wait for rain once his system is installed.

Table 3 shows adjusted use rates for corn and alfalfa in eastern South Dakota. The maximum use rate for alfalfa extends over a longer period than corn. These are the figures you would use in planning your irrigation system and on the average your crop would need more water during the critical depletion period in only 1 year out of 5. These rates are based on July climate with two-thirds of the expected rainfall reaching the soil moisture reservoir.

Table 3 and figure 1 can be used to help explain why a farmer needs a higher pumping rate to irrigate an acre of light sandy soil than he needs for an acre of heavy silt loam or clay soil. First, keep in mind that the sandy soil moisture reservoir does not have as large a capacity for moisture as does a heavy soil reservoir. Second, the probability of having rain and low moisture use on any *one* day is less than the chances for rain and low moisture use during a period of a week or more—hence the adjusted use rate as an average for a period of more than a day decreases as the time period becomes longer (for corn in table 3 it is from 0.29 of an inch daily for a 1-day period to 0.19 daily for a period of 14 days).

Thus, because the light sandy soil moisture reservior has less capacity and is depleted more rapidly, the time element for replenishing this moisture (by rain or irrigation water) becomes shorter. For this reason, in planning an irrigation system, allowance must be made for a higher pumping rate to compensate for the shorter irrigation periods in sandy soils.

COMPARING YOUR SOILS

The effective use rates for corn in table 3 have been used in calculations to construct the chart (figure 1) which you can use to compare light soil and heavy soil water needs of corn. On this basis for 160 acres of light soil you would need an irrigation system that would supply about 1,200 gallons of water a minute on a 20-hour-per-day running time (note line "corn on light soil"). But, using line "corn on heavy soil," note that the same well and same pump rate would irrigate more than 190 acres of heavy soil.

Table 2. July Average Rainfall per Day for Time Periods Indicated (Exceeded 4 Years Out of 5)

Days	Rainfall (inches per day)
1	less than 0.01"
7	less than 0.01"
14	.027"
30	.032"

Table 3. July Adjusted Use Rates (Exceeded 1 Year Out of 5). (Expected crop use less ⅔ expected rainfall).

Days	Adjusted use rates (inches per day) CORN	ALFALFA
1	.29	.31
7	.23	.25
14	.19	.20
30	.17	.18

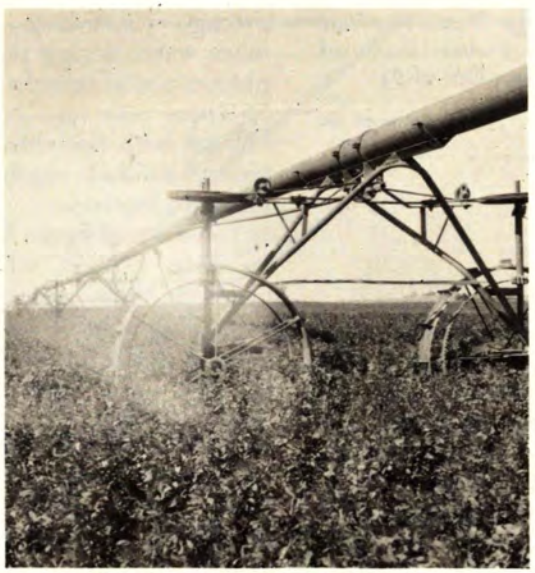
The reason for the difference is that there is a better chance of rain to occur during the longer irrigation period on the heavier soil with the larger moisture reservoir. A graph similar to figure 1 could be made for alfalfa. This example is based on east-central South Dakota conditions. If we go to a lower rainfall climate, the expected rainfall and the benefit of using adjusted use rates is less. For example, in northwestern South Dakota an irrigation system for corn should be based on an adjusted use rate of 0.23 of an inch per day for 7 days and 0.21 of an inch per day for 14 days.

The rainfall and use rates given here are based on research data available at this time. These values can be improved as more data are obtained.

While these adjusted use values are exceeded during the critical use period 1 year out of 5, there would be a relatively small reduction in yield as compared to the other 4 years. As a result, this is a practical basis for planning where there is a considerable amount of rainfall. □

See Next Page for Pictures of Five Types of Irrigation Systems Used in South Dakota

TOW LINE



SIDE-MOVE TOW

Five of the Irrigation System Types Being Used in South Dakota

SELF-PROPELLED

BOOM

GATED PIPE

(From page 9)

Family Estate Planning

business so that they may carry the business from one generation to the next.

Use of Life Insurance

A life insurance program may be used in an estate plan to provide financial protection at death, to meet expenses and debts, as a systematic savings program, and as a retirement program. It may also be used to distribute assets equitably among heirs, to complete a partnership arrangement, and to provide funds for children's education.

Tax Sheltered Retirement Plan

Recent federal legislation permits self-employed individuals, including partners, to set up a tax sheltered retirement plan with current income deductions for contributions to the plan. If an individual elects to claim the fund at or near retirement age, he will presumably be in a lower income tax bracket and have more exemptions and credits when he receives retirement benefits than during his higher income earning years.

HOW TO START YOUR ESTATE PLAN

1. If you haven't had a serious discussion with your wife and family members on what your objectives and goals are—this is the place to start. If you have, you may want to review them. What are your social and material wealth plans?
2. Who will continue to operate your farm when you retire or die? Should the farm be sold or divided prior to or upon your death, or kept intact as one operating unit?
3. How can security for your spouse and minor children be cared for?
4. Make a complete inventory of your assets, both real and personal property. Use realistic market values. Include your bank account, securities, life insurance, and other property that you own. List all of your debts.
5. Learn as much about the inheritance laws of South Dakota and the federal estate laws and taxes as you can.
6. Start considering an attorney, an insurance estate planning advisor, a bank trust officer, an accountant or other competent estate-planning workers. Spend some time in selecting the individuals or firms since there is a real difference between knowing the laws, which is important, and having the training and ability to help you understand your objectives and what you can and cannot do to accomplish your objectives. Estate planners that have all of the capabilities that you may need are not in large supply. This increases the importance of using care in your selection process. □

(From page 3)

Selenium Research Ends at Reed Ranch Field Laboratory

in the season after the high levels of selenium in the grass have had a chance to affect them? Apparently so. Indications were that early breeding (starting May 1) resulted in an improvement in percent calf crop over late breeding (starting mid-July). Weaning weights also favored the early group. But here, again, a management problem became evident: What kind of setup did the rancher have for caring for these calves born (in February) to the early bred cows?

The possibility of differences between sexes as well as colors (Angus and Hereford, for example) in their susceptibility to selenium poisoning were also investigated. Studies of sex differences took scientists back to the biochemistry laboratory to work with smaller animals (guinea pigs, rats and the fruit fly). Difference in sexes in tolerance of selenium was found to be highly significant in fruit flies —that is, females outnumbered the males under conditions of exposure to selenium while the reverse was true when selenium was not a factor. This finding must be carried on up the research ladder to see why, or if such relationships might exist among range cattle. Studies with bulls were inconclusive: one year selenium-fed animals showed depressed growth and decline in semen quality, while another year the differences were not so apparent. A study with sheep indicated that reproductive performance was lower in a selenium group than in a control group.

Now Study Selenium Lack

Selenium research at Reed Ranch has provided a store of information for a variety of uses, many undoubtedly still unknown. For example, while prior research has been concerned mostly with too much selenium, scientists have found and are studying reported cases of selenium deficiencies in some poultry and livestock feeds. It appears that either too little or too much selenium may result in problems. Agricultural Experiment Station poultry scientists and chemists are now taking a look at beneficial effects of selenium. The differences between injurious and beneficial amounts in chickens, for instance, may be only about 6 p.p.m. With chickens, 2 p.p.m. of selenium added to a purified diet gave an increase in growth and egg production. But 8 p.p.m. of the element retarded growth somewhat and greatly reduced egg productivity and hatchability.

We are far from being finished with our selenium studies. But our backgound of field data and experience will permit more effective continued research. □

Rabbits With Lightweight Hearts

RABBITS with light hearts are a serious matter with a South Dakota State University research zoologist.

These rabbits have hearts actually lighter than normal in weight, the difference being in the amount of tissue, according to the young researcher who is studying effects of feeding an experimental drug.

The rabbits are newborn offspring of mothers fed during pregnancy with a cholesterol lowering drug, D-thyroxine, widely used for human cardiovascular treatment in Canada, England and Western Europe, explains Gary A. Thibodeau, zoology instructor in the SDSU Entomology-Zoology Department. He was notified in late April that the drug has just been released by the federal Food and Drug Adminstration for use in human medicine in the United States. Previously, it was available for only restricted experimental work.

"Just what," you may ask, "is the importance of rabbits with hearts lighter than normal?"

In the first place, it's something unexpected and that always catches researchers' attention. Thibodeau says that research elsewhere using adult non-pregnant rats gave just the opposite findings—increases in heart weights. A French firm conducting tests with rabbits found no alterations in either mother or offspring when the drug was administered at low levels. "The significant difference in heart weight we found was both surprising and unique," he states.

LITTLE KNOWN ABOUT DRUG

"Almost nothing is known concerning the alterations of D-thyroxine in relation to pregnancy progression or its effects involving newborn mammals, including humans," the SDSU zoologist points out. He adds "in countries where the drug has been released for use in human medicine, it is 'contraindicated' during pregnancy and not recommended for use by children under 12 years of age. Until more is known concerning dextro-thyroxine alterations in pregnant or pediatric patients such restrictions appear both justifiable and prudent." He anticipates considerable more will be done in research now that some of the restrictions on use of the drug have been removed.

As far as agriculture is concerned, drugs affecting the thyroid gland are being tried in the dairy industry to increase milk production, Thibodeau explains. "Proper thyroid gland function is important not only in formation of milk but also in normal growth and reproduction of farm animals. Use of thyroactive compounds such as dextro-thyroxine to attempt to increase reproduction or growth efficiency is now under intensive study. But, before it is extensively used for such purposes more must be known about effects of the drug on both dam and offspring when administered during pregnancy."

Dr. Robert N. Swanson, Agricultural Experiment Station staff member and Thibodeau's graduate adviser, says "in our research we are definitely not working with or attempting to apply our findings to human medicine—that is not within our field. But we hope our findings will contribute information which can be used in some way in the overall search for suitable compounds to help even one segment of the human population suffering from certain cardiovascular difficulties. Remember, cardiovascular diseases are by far the leading cause of death in the Western World."

TO REPEAT EXPERIMENT

Meanwhile, Thibodeau who is studying for his doctor's degree, plans to repeat the experiment. "After all, our findings, while conclusive, were for only one time. They must be supported by seeing if the same alterations appear in repeated experiments."

The research is to be expanded employing pregnant and non-pregnant female rabbits with both high and normal cholestrol blood levels. Offspring will be closely observed in an effort to determine if smaller heart size is a defect—that is, how would a rabbit with a lighter-than-normal heart differ from a normal rabbit. Thibodeau emphasizes, "we have only started."

The D-thyroxine drug? Thirty-grams—about 3 tablespoonfuls — were donated by the manufacturer. It is enough for most of the planned additional research even if the comparatively massive—for rabbits —treatment rates are continued. Thibodeau will not estimate the value of the small bottle of the drug but does say ". . .the reason we keep it in a safe is not only because it is a prescription drug and its use restricted. □

Agricultural Experiment Station
SOUTH DAKOTA STATE UNIVERSITY
University Station, Brookings 57006
Duane Acker, Director
Publication

Postage Paid
U. S. Department of Agriculture

R. C. Wahlstrom
Animal Husbandry
Ag. Hall

BB